

Figure 4-2. Overview of the 100-K Area after D4 Activity and SSE.

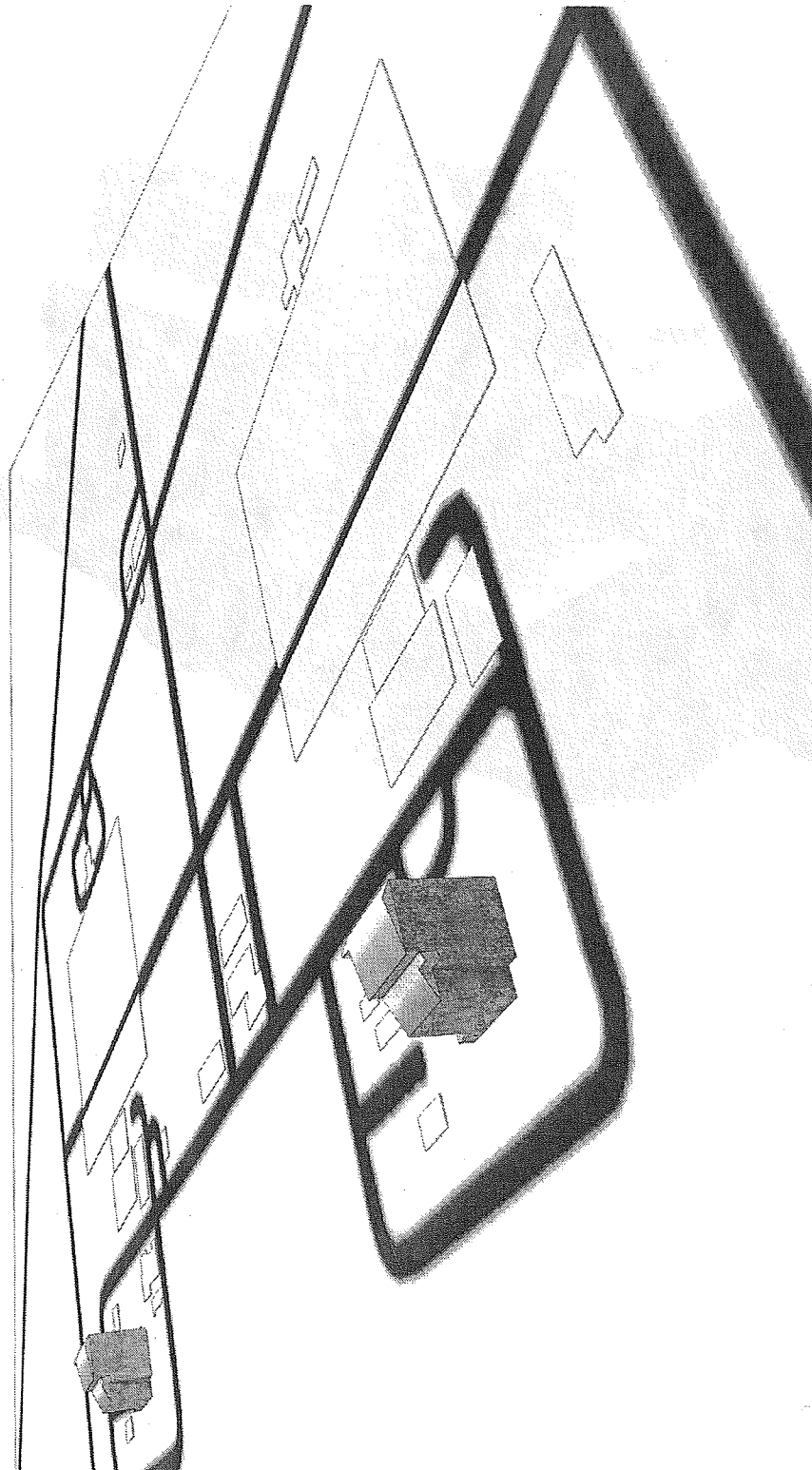


Figure 4-3. 105-KE and 105-KW Reactor Facilities, Present Condition.

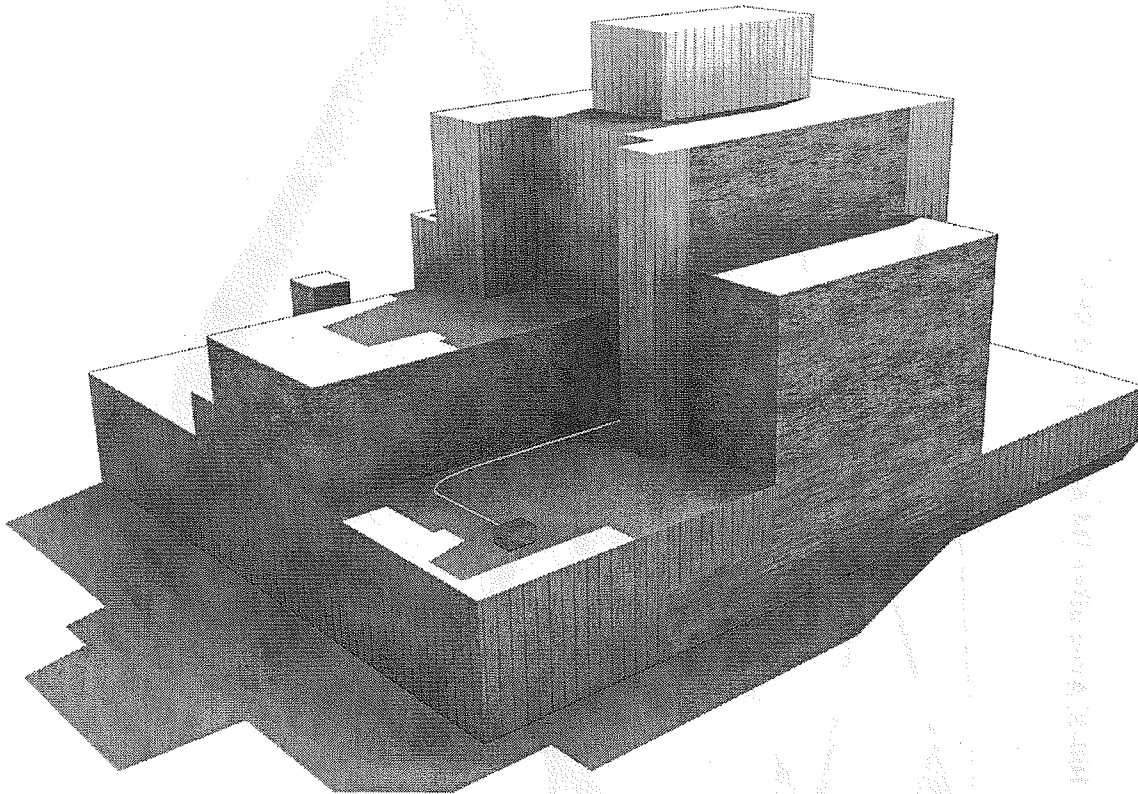


Figure 4-4. 105-KE and 105-KW Reactor Facilities, Portions to be Removed.

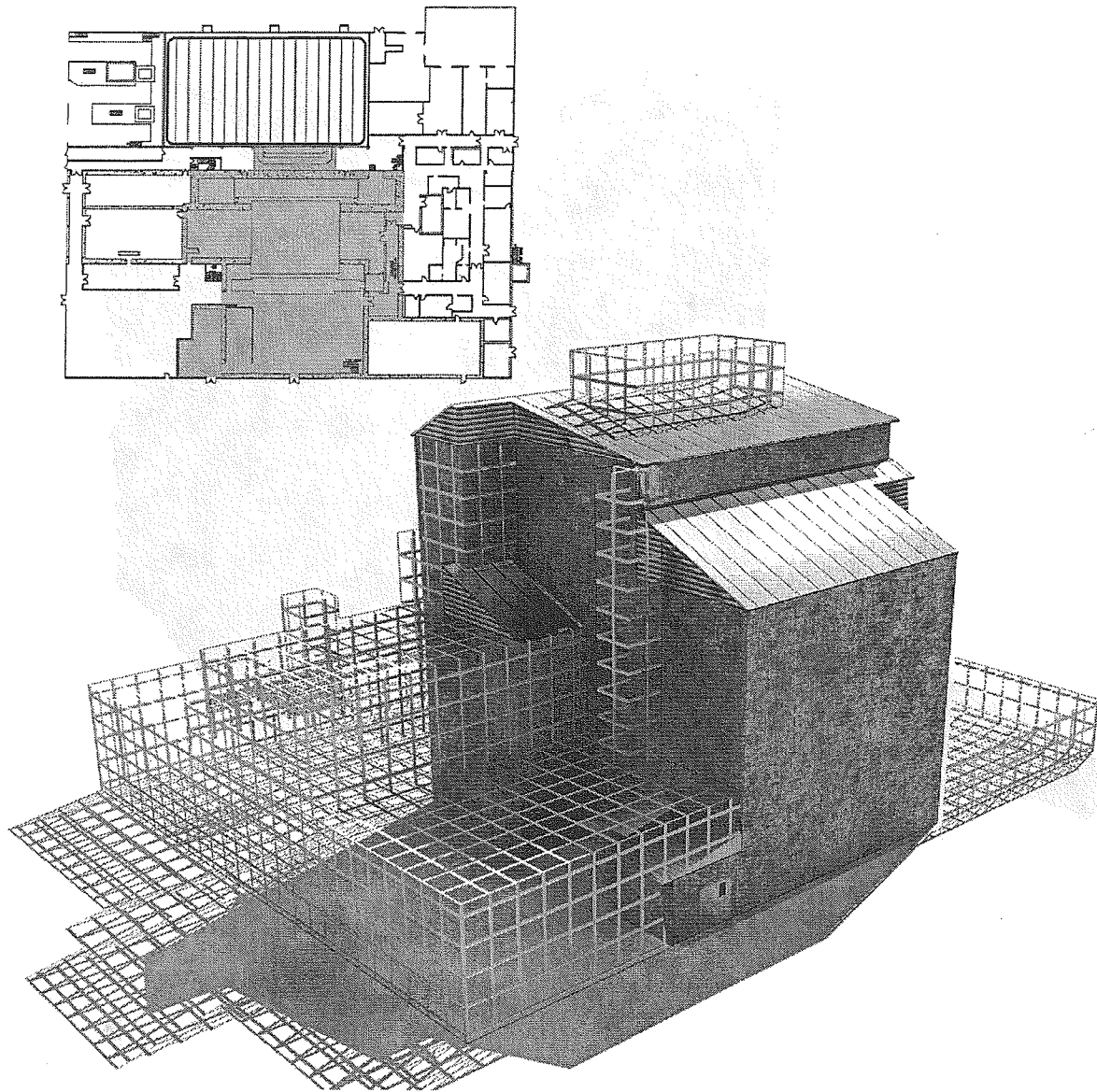
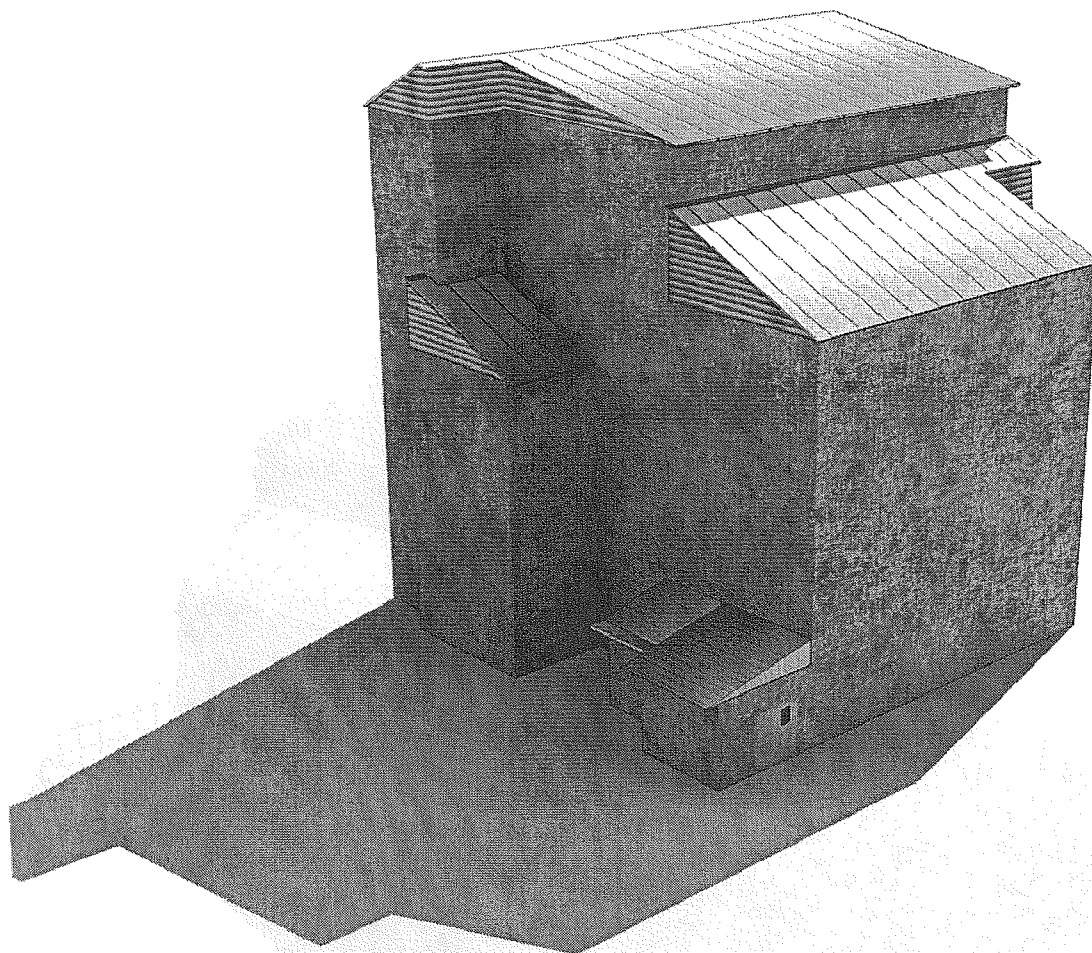


Figure 4-5. Safe Storage Enclosure.



4.2.4 Long-Term Surveillance and Maintenance

Long-term S&M would be required only for the 105-KE and 105-KW Reactor blocks. S&M would continue to occur until final disposition of the reactor blocks, sometime before the year 2068. By design, the SSE structure would require minimal S&M. It would be equipped with remote monitoring equipment and would require physical entry only once every 5 years. The design of the SSE structure would be such that no significant maintenance would be required.

4.2.5 Alternative II Cost

The detailed cost estimates for Alternative II are provided in Table 4-1 in both the nondiscounted (2006 dollars) and discounted (present-worth) dollars. Discounting of the estimated costs was conducted in accordance with Sections 4 and 5 of the EPA guidance in *A Guide to Developing and Documenting Cost Estimates During Feasibility Study* (EPA 540-R-00-002 and OSWER 9355 0-75; dated July 2000) (EPA 2000a). A discount rate of 3.1% was used as noted in Appendix C of *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs* (OMB 1992). All D4 and ISS actions were discounted over a 6-year period to reflect the expected project duration of 2006 to 2012. The long-term S&M costs for the SSE were discounted over a 48-year period to reflect the S&M from the end of ISS work until the start of reactor block removal.

The reactor costs are shown as a composite of the various subelements estimated for those buildings. While the estimates for all the buildings listed include these subelement costs, they are only shown for the reactors. The cost estimates to implement this alternative were developed using the following methods:

- The *River Corridor Contract Integrated Project Baseline* (IPB) (WCH 2005) was used as the starting point for the D4 cost and waste volume estimates for the reactor and ancillary facilities. The individual building baseline cost estimates were adjusted to include all engineering, project management, and support costs that appear elsewhere in the published IPB.
- The estimated costs for the ISS of the reactor building were based, in part, on the IPB, which was built from the actual costs incurred to date for ISS of the 105-C, 105-D, 105-DR, 105-H, and 105-F Facilities, and entailed similar activities and waste volumes as those proposed for the 105-KE and 105-KW Buildings.

The waste disposal costs for Alternative II are shown in Table 4-2. These were developed with the current ERDF disposal rates and the volumes from the IPB noted above.

The cost associated with the preparation for transportation, transport, and disposal of the 105-KE and 105-KW Reactor blocks to the 200 Area Plateau within the ISS period is not included in the current estimate or the scope of this document.

Table 4-1. Cost Estimate for Alternative II – ISS of the 105-KE and the 105-KW Reactors Followed by Long-Term S&M, and D4 of Ancillary Facilities and Portions of the 105-KE and 105-KW Reactor Facilities^a. (3 Pages)

| Building Number and Name | Nondiscounted Estimated Cost (\$) | Discounted Estimated Cost (\$) ^b |
|--|-----------------------------------|---|
| 105-KE Reactor Building – Total ISS Cost | \$ 16,083,529 | \$ 14,473,253 |
| D4 Management and Labor | 6,561,120 | 5,904,223 |
| D4 Equipment | 2,093,297 | 1,883,717 |
| D4 Supplies | 3,276,982 | 2,948,892 |
| SSE Installation | 4,152,130 | 3,736,420 |
| 105-KW Reactor Building – Total ISS Cost | \$ 17,378,080 | \$ 15,638,194 |
| D4 Management and Labor | 7,221,390 | 6,498,387 |
| D4 Equipment | 2,343,930 | 2,109,257 |
| D4 Supplies | 3,660,630 | 3,294,129 |
| SSE Installation | 4,152,130 | 3,736,420 |
| Long-term S&M for both SSEs (discounted over 48-year performance period) | \$ 1,440,000 | \$ 665,405 |
| | | |
| 105-KE Water Tunnel Structure | 652,029 | 586,748 |
| 105-KW Water Tunnel | 656,061 | 590,376 |
| 296K105- Air Sparging Vent | 60,205 | 54,177 |
| 119-KE - Exhaust Air Sample Building | 66,890 | 60,193 |
| 142-K - CVDF includes 296K142 - CVDF Main Stack | 2,324,499 | 2,091,770 |
| 142-KA - CVDF Generator Building | 68,927 | 62,026 |
| 1506-K1 - Fiber Optics Computer Hut | 49,568 | 44,605 |
| 151-K - Switching Station | 40,223 | 36,195 |
| 151-KE - Substation 230-KV | 160,890 | 144,782 |
| 151-KW - Substation 230-KV | 160,890 | 144,782 |
| 1604-K - Process Building KR4 | 15,538 | 13,982 |
| 1605-K - Guard Towers and Fences, to include poles, lines and above-grade utility piping | 15,329 | 13,794 |
| 1606-K - Transfer Building KR-3 | 5,827 | 5,244 |
| 1607-K - Transfer Building 1 | 5,827 | 5,244 |
| 165-KE - Power Control Building | 3,603,596 | 3,242,804 |
| 165-KW - Power Control Building | 3,603,596 | 3,242,804 |
| 166A-KE - Oil Storage Facility Valvehouse | 21,362 | 19,223 |
| 166A-KW - Oil Storage Facility Valvehouse | 21,362 | 19,223 |
| 167-K/167-KE - Crosstie Tunnel Building | 1,497,918 | 1,347,946 |

Table 4-1. Cost Estimate for Alternative II – ISS of the 105-KE and the 105-KW Reactors Followed by Long-Term S&M, and D4 of Ancillary Facilities and Portions of the 105-KE and 105-KW Reactor Facilities^a. (3 Pages)

| Building Number and Name | Nondiscounted Estimated Cost (\$) | Discounted Estimated Cost (\$) ^b |
|--|---|---|
| 1705-KE - Effluent Water Treatment Pilot Plant | 156,803 | 141,104 |
| 1706-KE - Water Studies Semi-Works Facility | 839,573 | 755,515 |
| 1706-KEL - Development Laboratory | 898,254 | 808,321 |
| 1706-KER - Water Studies Recirculation Building | 380,654 | 342,543 |
| 1713-KE - Shop Building | 14,360 | 12,922 |
| 1713-KER - Warehouse | 61,989 | 55,783 |
| 1713-KW - Warehouse | 13,948 | 12,552 |
| 1714-KE - Oil and Paint Storage Shed | 65,145 | 58,623 |
| 1714-KW - Warehouse | 54,959 | 49,457 |
| 1717-K - Maintenance/Transportation Shop – includes 1717A-KE | 763,853 | 687,376 |
| 1724-K - Maintenance Shop | 327,896 | 295,067 |
| 1724-KA - Equipment Shed | 48,429 | 43,580 |
| 1724-KB - Gas Bottle Storage Facility | 20,921 | 18,826 |
| 181-KE - River Pump House | 424,563 | 382,056 |
| 181-KW - River Pump House | 427,627 | 384,813 |
| 183.1-KE - Headhouse | 811,882 | 730,596 |
| 183.2-KE - Basins/Sedimentation | 5,273,049 | 4,745,111 |
| 183.3-KE - Basin/Filters | 1,232,409 | 1,109,020 |
| 183.4-KE - Reservoir and Clearwells | 2,243,261 | 2,018,666 |
| 183.5-KE - Lime Feeder Building | 116,717 | 105,031 |
| 183.6-KE - Lime Feeder Building | 120,639 | 108,561 |
| 183-K - Pipe Tunnels (183.7-KE) | 959,559 | 863,488 |
| 183-KE - Chlorine Vault | 737,509 | 663,670 |
| 185-K - Potable Water Treatment Plant | 122,199 | 109,964 |
| 1908-KE - Effluent Water Monitoring Station | 37,889 | 34,096 |
| 190-KE - Main Pump House | 3,251,017 | 2,925,525 |
| CC1K0035, CC1K0036, CC1K0037, CC1K0176, CC1K0177, CC1K0178, CC1K0179, CC1K0180, CC1K0181, CC1K0182, CC1K0236 – Cargo Containers | 50,152 | 45,131 |
| HS0028, HS0080, HS0081 - Storage Containers | 15,096 | 13,585 |
| KA-CW-01 - CERCLA Storage Unit | 161,545 | 145,371 |
| MO-048, MO-054, MO-060, MO-101, MO-102, MO-236, MO-237, MO-293, MO-323, MO-382, MO-401, MO-402, MO-442, MO-495, MO-495, MO-500, MO-506, MO-507, MO-728, MO-731, MO-907, MO-917, MO-928, MO-955, MO-969 – Mobile Offices | 2,025,507 | 1,822,713 |

Table 4-1. Cost Estimate for Alternative II – ISS of the 105-KE and the 105-KW Reactors Followed by Long-Term S&M, and D4 of Ancillary Facilities and Portions of the 105-KE and 105-KW Reactor Facilities^a. (3 Pages)

| Building Number and Name | Nondiscounted Estimated Cost (\$) | Discounted Estimated Cost (\$) ^b |
|--|---|---|
| Ancillary Facility D4 Subtotal | \$ 34,687,941 | \$ 31,214,984 |
| Reactor ISS and Long-term S&M Subtotal | \$ 34,901,609 | \$ 30,776,852 |
| Reactor ISS and Long-term S&M and Ancillary Facility D4 Totals for Alternative II | \$ 69,589,550 Nondiscounted | \$ 61,991,836 Discounted |

^a Cost estimate for D4 of the 105-KE and 105-KW Facilities does not include costs required for preparation for transport and disposal of the 105-KE and 105-KW Reactor blocks.

^b Discounted at 3.1% for a 6-year performance period unless otherwise noted

CVDF = Cold Vacuum Drying Facility

D4 = deactivation, decontamination, decommissioning, and demolition

ISS = interim safe storage

S&M = surveillance and maintenance

SSE = safe storage enclosure

Table 4-2. Cost Estimate for Alternative II Waste Disposal.

| Waste Costs | Nondiscounted Estimated Cost | Discounted Estimated Cost |
|---|------------------------------------|---------------------------------|
| D4 wastes from 105-KE and 105-KW | \$ 2,080,142 | \$ 1,871,878 |
| D4 waste from ancillary facilities | \$ 8,832,920 | \$ 7,948,568 |
| Total Waste Costs for Alternative II | \$ 10,913,062 | \$ 9,820,446 |

D4 = deactivation, decontamination, decommissioning, and demolition

4.3 ALTERNATIVE III – LONG-TERM S&M FOLLOWED BY D4 OF ANCILLARY FACILITIES AND THE 105-KE AND 105-KW REACTOR FACILITIES

Alternative III would consist of long-term S&M (including Hanford Site institutional controls described in Section 4.1) of ancillary facilities and the 105-KE and 105-KW Reactor Facilities, followed by D4 prior to 2068 when the transport and disposal for the 105-KE and 105-KW Reactor blocks to the 200 Area Plateau will occur. In accordance with Tri-Party Agreement Milestone M-16-00, S&M would be conducted for the ancillary facilities until 2018 at which time the D4 phase would be started for these structures. This would allow adequate time for completion of D4 and remedial action by 2024, as required by the M-16-00 Milestone. Other M-16 and M-93 Milestones listed in Section 1.4, notably the M-16-00A and M-16-53 Milestones, would require additional negotiation with the Tri-Parties to modify these existing commitments. The 105-KE and 105-KW Reactor Facilities, however, would be in an S&M

program through 2060, after which D4 would be implemented and completed by 2068. See Table 4-3 for a full explanation of the timing of the S&M and D4 periods. The D4 phase of this alternative would be the same as described in Alternative II (Section 4.2.2), except for preparation for ISS. After the S&M period (to conclude in 2017), the ancillary facilities would be demolished and subsurface contamination would be managed as described in Alternative II (Section 4.2.3). The 105-KE and 105-KW Reactor Facilities would be left in a condition to immediately implement final disposition of the reactor block to the 200 Area Plateau in accordance with prior decisions made under NEPA. The SSE structure would not be constructed under this alternative.

The S&M measures would include routine radiological and hazard monitoring of the facilities, safety inspections, and periodic confirmatory measurements of ventilation systems, as required. The S&M activities would be tailored to the specific condition of each facility. Activities would be balanced to reduce hazards to workers while reducing the potential for releases of contaminants. Major repairs such as re-roofing and shoring structural components would be necessary for the 105-KE and 105-KW Reactor Facilities prior to D4 activities. These major repairs would be required to ensure the integrity of the facilities, which are necessary to contain contaminants within the structures. It is anticipated that a new roof would be required for the reactor building at least twice during the S&M period, as the type of roofs currently used typically have a 20-year life. Other major repairs would be performed at the reactor facilities during their corresponding S&M periods on an as-needed basis.

As facilities age and deteriorate, typically S&M must become more aggressive and would involve increased frequency of required activities and a higher level of worker protection, which would increase cost. As cost increases, long-term S&M would become less viable. As the facilities continue to age and S&M is necessarily more aggressive, it may not be cost-effective to prolong the S&M period for the 105-KE and 105-KW Reactor Facilities through 2060. D4 of the reactor facilities may be required sooner to ensure that releases would not occur. Without an increasingly aggressive S&M program, the threats associated with unplanned releases to the environment would increase. Conversely, an aggressive S&M program would require workers to enter facilities more often, and workers may be required to perform more invasive procedures to maintain the facilities, which would increase the potential for exposure to workers. Additionally, personal protection requirements to maintain the more aggressive program continually increase, which would add to the cost.

A variety of waste streams would be generated in the performance of S&M that would be characterized, packaged, and disposed. Waste that meets the ERDF waste acceptance criteria would be disposed at the ERDF, and other wastes would be managed to comply with identified ARARs.

Table 4-3. Alternative III Timelines.

Reactor Buildings

Main Regulatory Driver – A 75-year safe storage period is consistent with the current anticipated time frame for decommissioning of the eight surplus Hanford Site reactors, which is expected to be complete by 2068 (i.e., 75 years from the 1993 baseline date.)

Therefore, 1993+75=2068

- 8 years to complete D4 and block removal

2060 start D4, end S&M

2006 publish date of EE/CA

54-year S&M period

Ancillary Facilities

Main Regulatory Driver – Tri-Party Agreement Milestone M-16-00 for completion of all remediation in 2024, it is noted that M-16-00A and M-16-53 would need to be adjusted with Alternative III as discussed in the text.

Using on the M16-00 Milestone will require that other earlier milestones, noted in Section 1.4 of this document, for the K Area D4 and Remedial Action be adjusted or deleted as needed

Therefore 2024 meets Tri-Party Agreement Major Milestone

- 6 years for completion of D4 and Soil Remediation

2018 start D4, end S&M in 2017

2006 publish date of EE/CA

12-year S&M period

D4 = deactivation, decontamination, decommissioning, and demolition

EE/CA = engineering evaluation/cost analysis

S&M = surveillance and maintenance

4.3.1 General Surveillance and Maintenance

During the S&M phase of this alternative, existing institutional controls would be maintained to warn area workers of potential hazards and to restrict public access to the 100-K Area. Access to specific facilities with substantial radiological contamination would be restricted for nonradiological workers. The S&M measures would include routine radiological and hazard monitoring of the facilities, periodic safety inspections, and basic facility maintenance (as required), based on the condition of each specific facility. Activities would be balanced to reduce worker hazards and the potential for contaminant release. Major repairs such as re-roofing and shoring structural components would be performed, as necessary, to ensure facility integrity for containment of hazardous substances within the structure.

4.3.2 Roof Maintenance and Replacement

Roofs typically require replacement or resurfacing approximately every 20 years. For the purposes of this EE/CA it was assumed that reroofing would only be necessary for the reactor buildings during the S&M period, for which reroofing costs would be incurred twice. The cost of reroofing the buildings (including waste disposal) was estimated based on the total square foot area of the building roofs, times \$15.59/ft². See Appendix B for further information on the development of this rate.

4.3.3 Alternative III Cost

The costs to implement this alternative were estimated on an annual basis in 2006 dollars and then summarized for the S&M period (up to 2018) for the ancillary facilities and up to 2060 for the 105-KE and 105-KW Reactor Facilities (Table 4-4). Costs have not been factored into the estimate to account for the increased resource demands on the S&M program that would be required over time, nor have costs associated with increased worker protection measures been included. Aside from the estimates for roof replacement and associated waste disposal costs that would be required on the reactors every 20 years, costs associated with other potential major repairs have not been included in the estimate because of the unknown frequency and magnitude of the required repairs.

Costs are presented in both the nondiscounted (2006 dollars) and discounted (present-worth) dollars. Discounting of the estimated costs were conducted in accordance with Sections 4 and 5 of the EPA guidance in *A Guide to Developing and Documenting Cost Estimates During Feasibility Study* (EPA 2000a). A discount rate of 3.1% was used as noted in Appendix C of OMB (1992) for projects with durations greater than 30 years.

The reactor costs are shown as a composite of the various subelements estimated for those buildings. While the estimates for all the buildings listed include these subelement costs, they are only shown for the reactors.

The S&M costs for the two reactor buildings was estimated and discounted over a 54-year period to reflect the S&M until the start of reactor block removal. Roof replacement and waste disposal was estimated and discounted for application in 2026 and 2046. Reactor D4 costs were discounted until 2060 to reflect the start of D4/block removal. S&M for ancillary facilities was estimated and discounted over a 12-year period until the start of D4 in 2018. The D4 work scope was discounted over a 6-year period to reflect the expected project duration of 2018 to 2024.

Identification of Removal Action Alternatives

DOE/RL-2005-86

Rev. 0

Table 4-4. Cost Estimate for Alternative III – Long-Term S&M Followed by D4 of Ancillary Facilities and the 105-KE and 105-KW Reactor Facilities^a. (4 Pages)

| Building Number and Name | Nondiscounted D4 Costs (\$) | Nondiscounted S&M Costs (\$) ^b | Discounted D4 Costs (\$) | Discounted S&M Costs (\$) ^b |
|--|-----------------------------------|---|--------------------------------|--|
| 105-KE – Costs | \$ 11,931,399 | \$ 1,299,065 | \$ 2,294,687 | \$ 626,777 |
| D4 Management and Labor | 6,561,120 | | 1,261,857 | |
| D4 Equipment | 2,093,297 | | 402,590 | |
| D4 Supplies | 3,276,982 | | 630,240 | |
| S&M until 2060 | | \$ 1,299,065 | | \$ 626,777 |
| | | | | |
| 105-KW – Costs | \$ 13,225,950 | \$ 1,299,114 | \$ 2,543,659 | \$ 626,800 |
| D4 Management and Labor | 7,221,390 | | 1,388,842 | |
| D4 Equipment | 2,343,930 | | 450,793 | |
| D4 Supplies | 3,660,630 | | 704,025 | |
| S&M until 2060 | | \$ 1,299,114 | | \$ 626,800 |
| | | | | |
| Reactor Roof Replacements (four total) | | \$ 3,658,973 | | \$ 1,532,962 |
| | | | | |
| 105-KE Water Tunnel Structure | 652,029 | <i>included with 105-KE above</i> | 452,025 | <i>included with 105-KE above</i> |
| 105-KW Water Tunnel | 656,061 | <i>included with 105-KW above</i> | 454,821 | <i>included with 105-KW above</i> |
| 296K105- Air Sparging Vent | 60,205 | <i>included with 105-KW above</i> | 41,738 | <i>included with 105-KW above</i> |
| 119-KE - Exhaust Air Sample Building | 66,890 | 1,407 | 46,372 | 1,160 |
| 142-K - CVDF includes 296K142 - CVDF Main Stack | 2,324,499 | 85,608 | 1,611,482 | 70,590 |
| 142-KA - CVDF Generator Building | 68,927 | 3,188 | 47,784 | 2,629 |
| 1506-K1 - Fiber Optics Computer Hut | 49,568 | 2,293 | 34,364 | 1,891 |
| 151-K - Switching Station | 40,223 | 1,968 | 27,885 | 1,623 |

Table 4-4. Cost Estimate for Alternative III – Long-Term S&M Followed by D4 of Ancillary Facilities and the 105-KE and 105-KW Reactor Facilities^a. (4 Pages)

| Building Number and Name | Nondiscounted D4 Costs (\$) | Nondiscounted S&M Costs (\$) ^b | Discounted D4 Costs (\$) | Discounted S&M Costs (\$) ^b |
|--|-----------------------------------|---|--------------------------------|--|
| 151-KE - Substation 230-KV | 160,890 | 27,552 | 111,539 | 22,719 |
| 151-KW - Substation 230-KV | 160,890 | 27,552 | 111,539 | 22,719 |
| 1604-K - Process Building KR4 | 15,538 | 3,936 | 10,772 | 3,246 |
| 1605-K - Guard Towers and Fences, to include poles, lines and above-grade utility piping as well | 15,329 | 984 | 10,627 | 811 |
| 1606-K - Transfer Building KR-3 | 5,827 | 3,936 | 4,040 | 3,246 |
| 1607-K - Transfer Building 1 | 5,827 | 3,936 | 4,040 | 3,246 |
| 165-KE - Power Control Building | 3,603,596 | 133,416 | 2,498,228 | 110,011 |
| 165-KW - Power Control Building | 3,603,596 | 259,776 | 2,498,228 | 214,204 |
| 166A-KE - Oil Storage Facility Valvehouse | 21,362 | 1,565 | 14,809 | 1,290 |
| 166A-KW - Oil Storage Facility Valvehouse | 21,362 | 1,565 | 14,809 | 1,290 |
| 167-K/167-KE - Crosstie Tunnel Building | 1,497,918 | 24,600 | 1,038,446 | 20,284 |
| 1705-KE - Effluent Water Treatment Pilot Plant | 156,803 | 2,652 | 108,705 | 2,187 |
| 1706-KE - Water Studies Semi-Works Facility | 839,573 | 30,903 | 582,042 | 25,481 |
| 1706-KEL - Development Laboratory | 898,254 | 29,323 | 622,723 | 24,179 |
| 1706-KER - Water Studies Recirculation Building | 380,654 | 13,958 | 263,892 | 11,509 |
| 1713-KE - Shop Building | 14,360 | 664 | 9,955 | 548 |
| 1713-KER - Warehouse | 61,989 | 3,660 | 42,974 | 3,018 |
| 1713-KW - Warehouse | 13,948 | 886 | 9,670 | 730 |
| 1714-KE - Oil and Paint Storage Shed | 65,145 | 8,433 | 45,162 | 6,954 |
| 1714-KW - Warehouse | 54,959 | 3,665 | 38,101 | 3,022 |

Identification of Removal Action Alternatives

Table 4-4. Cost Estimate for Alternative III – Long-Term S&M Followed by D4 of Ancillary Facilities and the 105-KE and 105-KW Reactor Facilities^a. (4 Pages)

| Building Number and Name | Nondiscounted D4 Costs (\$) | Nondiscounted S&M Costs (\$) ^b | Discounted D4 Costs (\$) | Discounted S&M Costs (\$) ^b |
|---|-----------------------------------|---|--------------------------------|--|
| 1717-K - Maintenance/Transportation Shop – includes 1717A-KE | 763,853 | 55,286 | 529,549 | 45,587 |
| 1724-K - Maintenance Shop | 327,896 | 24,118 | 227,317 | 19,887 |
| 1724-KA - Equipment Shed | 48,429 | 3,075 | 33,574 | 2,536 |
| 1724-KB - Gas Bottle Storage Facility | 20,921 | 1,328 | 14,504 | 1,095 |
| 181-KE - River Pump House | 424,563 | 21,810 | 294,332 | 17,984 |
| 181-KW - River Pump House | 427,627 | 22,140 | 296,457 | 18,256 |
| 183.1-KE - Headhouse | 811,882 | 41,131 | 562,845 | 33,916 |
| 183.2-KE - Basins/Sedimentation | 5,273,049 | 1,846,506 | 3,655,593 | 1,522,574 |
| 183.3-KE - Basin/Filters | 1,232,409 | 771,672 | 854,380 | 636,298 |
| 183.4-KE - Reservoir and Clearwells | 2,243,261 | 1,111,443 | 1,555,163 | 916,463 |
| 183.5-KE - Lime Feeder Building | 116,717 | 4,246 | 80,915 | 3,501 |
| 183.6-KE - Lime Feeder Building | 120,639 | 4,389 | 83,634 | 3,619 |
| 183-K - Pipe Tunnels (183.7-KE) | 959,559 | 21,033 | 665,224 | 17,343 |
| 183-KE - Chlorine Vault | 737,509 | 2,521,716 | 511,285 | 2,079,333 |
| 185-K - Potable Water Treatment Plant | 122,199 | 6,278 | 84,716 | 5,177 |
| 1908-KE - Effluent Water Monitoring Station | 37,889 | 797 | 26,267 | 657 |
| 190-KE - Main Pump House | 3,251,017 | 124,520 | 2,253,799 | 102,676 |
| CC1K0035, CC1K0036, CC1K0037, CC1K0176, CC1K0177, CC1K0178, CC1K0179, CC1K0180, CC1K0181, CC1K0182, CC1K0236 – Cargo Containers | 50,152 | 35,040 | 34,768 | 28,893 |
| HS0028, HS0080, HS0081 - Storage Containers | 15,096 | 4,723 | 10,465 | 3,895 |
| KA-CW-01 - CERCLA Storage Unit | 161,545 | NA | 111,993 | NA |

Table 4-4. Cost Estimate for Alternative III – Long-Term S&M Followed by D4 of Ancillary Facilities and the 105-KE and 105-KW Reactor Facilities^a. (4 Pages)

| Building Number and Name | Nondiscounted D4 Costs (\$) | Nondiscounted S&M Costs (\$) ^b | Discounted D4 Costs (\$) | Discounted S&M Costs (\$) ^b |
|---|--|---|-------------------------------------|--|
| MO-048, MO-054, MO-060, MO-101, MO-102, MO-236, MO-237, MO-293, MO-323, MO-382, MO-401, MO-402, MO-442, MO-495, MO-495, MO-500, MO-506, MO-507, MO-728, MO-731, MO-907, MO-917, MO-928, MO-955, MO-969 – Mobile Offices | 2,025,507 | 368,867 | 1,404,203 | 304,157 |
| | | | | |
| Ancillary Facilities Subtotal | \$ 34,687,941 | \$ 7,667,544 | \$ 24,047,755 | \$ 6,322,431 |
| KE and KW Reactor Subtotals | \$ 25,157,349 | \$ 6,257,151 | \$ 4,838,346 | \$ 2,786,538 |
| Reactor and Ancillary Facilities Subtotals | \$ 59,845,290 | \$13,924,695 | \$ 28,886,101 | \$ 9,108,969 |
| Alternative III D4 and S&M Totals | \$ 73,769,985 Nondiscounted | | \$ 37,995,070 Discounted | |

^a Cost estimate for D&D of the 105-KE and 105-KW Facilities does not include costs required for preparation for transport and disposal of the 105-KE and 105-KW Reactor blocks.

^b S&M costs were calculated for the performance period as noted in Table 4-3 and where indicated were discounted at 3.1% for that same performance period.

CVDF = Cold Vacuum Drying Facility

D4 = Deactivation, Decontamination, Decommissioning and Demolition

S&M = Surveillance and Maintenance

The waste disposal costs for Alternative III are shown in Table 4-5. These were developed with the current ERDF disposal rates and the volumes from the IPB in Section 4.2.5. It should be noted that, other than reactor building roof replacement debris, no S&M waste disposal costs are included in this analysis. Some minor amounts of S&M waste are expected to be generated in Alternative III. While these volumes are within the scope of this EE/CA, their contribution would be much less than the D4 waste volumes (less than 0.1%) and are therefore considered to be negligible for the purposes of this analysis.

The cost of preparation for transportation and transport of the 105-KE and 105-KW Reactor blocks to the 200 West Area is not included in the estimate.

Table 4-5. Cost Estimate for Alternative III Waste Disposal.

| Waste Costs | Nondiscounted Estimated Cost | Discounted Estimated Cost |
|--|------------------------------------|---------------------------------|
| D4 wastes from 105-KE and 105-KW | \$ 2,080,142 | \$ 400,060 |
| D4 waste from ancillary facilities | \$ 8,832,920 | \$ 6,123,508 |
| | | |
| Total Waste Costs for Alternative III | \$ 10,913,062 | \$ 6,523,568 |

D4 = deactivation, decontamination, decommissioning, and demolition

4.4 COMMON ELEMENTS

Common elements that are shared between Alternative II (ISS and D4) and Alternative III (S&M) include historical properties management and waste management, as discussed in the following subsections.

4.4.1 Historical Properties Management

Alternatives II and III share a common end state that would result in the demolition and disposal of all facilities included in the scope of this EE/CA. As presented in Section 2.1.4, six of the facilities within the scope meet the NHPA criteria for consideration as historically significant properties. Appropriate documentation has been completed for the contributing buildings in the 100-K Area under the programmatic agreement (DOE-RL 1996). Interior assessment of the 100-K buildings has been conducted to identify and tag artifacts that may have interpretive or educational value. Tagged items would be removed from buildings and transferred to safe storage or photographed before any demolition activities occur.

4.4.2 Waste Management

Alternatives II and III would each generate waste that requires disposal at appropriate disposal sites, thus waste management would be a common element for these alternatives. Opportunities for waste minimization and pollution prevention would be evaluated to the extent practicable for each alternative. Materials that can be effectively decontaminated, and noncontaminated waste that can be effectively segregated from contaminated waste, may be recycled or sent to an approved sanitary landfill for disposal. For this purpose, materials may be recycled through the Hanford Centralized Consolidated Recycle Center (e.g., florescent light ballasts, emergency light batteries, non-radiologically contaminated used oil) provided that an off-site acceptability determination is obtained from the EPA pursuant to *Procedures for Planning and Implementing Off-Site Response Actions* (40 CFR 300.440). Noncontaminated water encountered during the removal action could be used for dust suppression. Another opportunity to minimize waste by recycling is the potential to move some of the mobile offices to another part of the site or even off-site for reuse.

Waste for which no reuse, recycle, or decontamination options are identified would be assigned an appropriate waste designation (e.g., solid, asbestos, PCB, radioactive, dangerous, or mixed) and disposed of accordingly. The preferred pathway for disposal of contaminated waste would be the ERDF. Construction and operation of the ERDF was authorized by the *Record of Decision for the Environmental Restoration Disposal Facility* (EPA 1995). The ERDF is an engineered structure located on the Hanford Site designed to meet RCRA minimum technological requirements for landfills, including standards for a double liner, a leachate collection system, leak detection, and a final cover.

In 1996, an explanation of significant difference (Ecology et al. 1996) clarified the ERDF ROD (EPA 1995) for eligibility of waste generated during Hanford Site cleanup activities. In accordance with the explanation of significant difference, any low-level waste, mixed waste, or hazardous/dangerous waste generated as a result of CERCLA or RCRA cleanup actions (e.g., D4, RCRA past-practice, and investigation-derived wastes) is eligible for ERDF disposal, provided that appropriate CERCLA decision documents are in place and that the waste meets *Environmental Restoration Disposal Facility Waste Acceptance Criteria* (BHI 2002). Consequently, contaminated waste generated during the removal action proposed in this EE/CA would be eligible for disposal at the ERDF. Previous EE/CAs for other Hanford Site facilities have shown that the ERDF provides a high degree of protection for human health and the environment and is more cost-effective than other disposal site options for comparable waste. Estimated waste volumes that would be generated for disposal at the ERDF would not be expected to significantly impact ERDF capacity limitations. The waste volumes in this document have been taken into consideration for ERDF planning purposes. Further discussions of the construction and operation of the ERDF are not within the scope of this EE/CA.

The preamble to the National Contingency Plan states that when noncontiguous facilities are reasonably close to one another and wastes at these sites are compatible for a selected treatment or disposal approach, CERCLA Section 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes and, therefore, allows the lead agency to manage waste transferred between such noncontiguous facilities without having to obtain a permit. The 100 Area sites addressed by this EE/CA and the disposal site, the ERDF, are reasonably close to one another, and the wastes are compatible for the selected disposal approach. Therefore, these sites are considered to be a single site for response purposes under this removal action.

While most waste generated during the removal action is anticipated to meet ERDF waste acceptance criteria, some waste may require treatment before disposal. In most cases, the type of treatment anticipated would consist of solidification/stabilization techniques such as macro-encapsulation or grouting. For waste that can not be sent to the ERDF, it is expected that management can occur at other Hanford Site facilities such as the Central Waste Complex or the Effluent Treatment Facility. The Central Waste Complex and Effluent Treatment Facility have existing off-site acceptability determinations from EPA and would require no additional regulatory approval for management of waste from this action. If wastes containing CERCLA hazardous substances are encountered that must be sent elsewhere for treatment or disposal, the EPA would establish an acceptability determination for proposed facilities in accordance with 40 CFR 300.440. Materials recycled through the Hanford Centralized Consolidated Recycle

Center (e.g., florescent light ballasts, emergency light batteries, nonradiologically contaminated used oil) would require an off-site acceptability determination from the EPA.

4.4.3 Common Requirement for End States

Alternatives II and III would each support an end state (i.e., final disposition) that would involve disposal of the 105-KE and 105-KW Reactor blocks to the 200 Area Plateau. As stated in the EIS ROD (58 FR 48509), the final proposed action for disposal of the reactor block would include the transport of the reactor block, intact, on a tractor transporter, from its present location in the 100 Areas to the 200 Area Plateau for disposal.

For Alternative II, planning activities for the preparation of the reactor block for transportation and disposal would occur during the latter stages of the S&M of the SSE. For Alternative III, planning activities for the preparation of the reactor block for transportation and disposal would occur as part of the reactor facility D4 planning activities, prior to the D4 of the reactor facilities by 2068. The actual transport and disposal would occur by 2068 for both alternatives. The costs associated with this common end state are not included in the current cost estimates for either alternative.

5.0 ANALYSIS OF REMOVAL ACTION ALTERNATIVES

In accordance with CERCLA requirements, removal action alternatives are evaluated against the following three criteria:

1. Effectiveness
2. Implementability
3. Cost.

Each criterion is briefly summarized in Table 5-1.

A detailed analysis of Alternative I (no action), Alternative II (ISS & D4), and Alternative III (S&M) being considered in this EE/CA relative to each criterion is provided in the following subsections, followed by a comparison of the alternatives against one another relative to each criterion. Results of the evaluation will be used to identify a preferred removal action alternative. Public acceptance of the preferred alternative will be evaluated when the public is given an opportunity to review and comment on this EE/CA. State acceptance will be evaluated by the Washington State Department of Ecology. After addressing comments, the DOE will document the selected removal action in an action memorandum subject to approval by EPA.

Table 5-1. Summary of Evaluation Criteria. (2 Pages)

| | |
|----------------------------|--|
| Effectiveness ^a | Overall Protection of Human Health and the Environment. The primary objective and a "threshold" criterion that must be met for a removal action to be eligible for consideration. This criterion addresses whether the alternative achieves adequate overall elimination, reduction, or control of risks to human health and the environment posed by the likely exposure pathways. Assessments of the other evaluation criteria are also drawn upon. Evaluation of the alternatives against this criterion was based on qualitative analysis and assumptions regarding the inventory of hazards in the remaining buildings to be addressed by this removal action. |
| | Compliance with ARARs. Like overall protection of human health and the environment, compliance with ARARs is a threshold criterion that must be met for an alternative to be eligible for consideration. This criterion addresses whether a removal action will, to the extent practicable, meet ARARs and other federal and state environmental statutes. The ARARs must be met for onsite CERCLA actions (CERCLA, Section 121[d][2]). Onsite actions are exempted from obtaining federal, state, and local permits (CERCLA, Section 121[e][1]). Nonpromulgated standards, such as proposed regulations and regulatory guidance, are also to be considered to the extent necessary for the removal action to be adequately protective. |
| | Long-Term Effectiveness and Permanence. The long-term effectiveness and permanence criterion addresses whether the alternative leaves an unacceptable risk after the removal action has been completed. It also refers to the reliability of a removal action to maintain long-term protection of human health and the environment after implementation. |

Table 5-1. Summary of Evaluation Criteria. (2 Pages)

| | |
|------------------|--|
| | Reduction of Toxicity, Mobility, or Volume Through Treatment. The reduction of toxicity, mobility, or volume through treatment criterion refers to an evaluation of the anticipated performance for treatment technologies that may be employed in a removal action. It assesses whether the alternative permanently and significantly reduces the hazard posed through application of a treatment technology. This could be accomplished by destroying the contaminants, reducing the quantity of contaminants, or irreversibly reducing the mobility of contaminants. Reduction of toxicity, mobility, and/or volume contributes to overall protectiveness. |
| | Short-Term Effectiveness. The short-term effectiveness criterion refers to an evaluation of the speed with which the removal action achieves protection. The criterion also refers to any potential adverse effects on human health and the environment during the implementation phases of the removal action. |
| Implementability | Implementability refers to the technical and administrative feasibility of a removal action, including the availability of materials and services needed to implement the selected solution. |
| Cost | The cost criterion evaluates the cost of the alternatives and includes capital, operation and maintenance, and monitoring costs. |

^a To provide a more comprehensive evaluation, the effectiveness criterion has been divided into several subcategories.

ARAR = applicable or relevant and appropriate requirement

CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*

5.1 EFFECTIVENESS

In order to provide a more comprehensive evaluation in this EE/CA, the effectiveness criterion has been divided into several subcategories. A description of the subcategories is presented in Table 5-1. The following subsections evaluate each of the effectiveness subcategories.

5.1.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment is the primary objective of the removal action. This criterion addresses whether the action achieves adequate overall elimination, reduction, or control of risks to human health and the environment posed by the likely exposure pathways. This criterion must be met for a removal action to be eligible for consideration. Evaluation of the alternatives against this criterion is based on qualitative analysis and assumptions regarding the inventory of hazards in the facilities to be addressed by the removal action.

Alternative I, the no action alternative, would not eliminate, reduce, or control risks to human health and the environment. Because implementation of this alternative would not meet removal action objectives or the threshold criterion for overall protectiveness, it cannot be considered a viable alternative. Consequently, Alternative I was not carried forward for further evaluation.

Alternative II would provide overall protection of human health and the environment. Substantial protection would be provided in the near term by conducting assessment, D4,